**Amendments to the Specification:**

Please replace paragraph [0028] with the following amended paragraph:

[0028] The invention includes a method and a system for creating and using a data store of profile-based simulation information. Figures 2 and 3 illustrate the differences between simulation profiles versus actual profiles of structures. Figures 4 to ~~8C~~ 8B depict embodiments of the creation process for the profile-based simulation data store. Figure 9A and 9B depict embodiments for using the profile-based simulation information. Figure 10 illustrates one format of the simulation data store, while figures 11A and 11B represents empirical data that illustrate the utility of the concepts and principles of the present invention.

Please replace paragraph [0032] with the following amended paragraph:

[0032] FIG. 4 is an architectural diagram illustrating the use of an optical metrology system to determine the profile of periodic structures. The optical metrology system **40** includes a metrology signal source **41** projecting a signal **43** at the target periodic structure **53** of a wafer **47** mounted on a metrology platform **55**. The metrology signal **43** is projected at an incidence angle θ towards the target periodic structure **53**. The reflected signal **49** is measured by a metrology signal receiver **51**. The reflected signal data **57** is transmitted to a metrology profiler system **59**. The metrology profiler system **59** compares the measured reflected signal data **57** against a library of calculated reflected signal data representing varying combinations of critical dimensions of the target periodic structure and resolution. The library instance best matching the measured reflected signal data **57** is selected. The profile and associated critical dimensions of the selected library instance correspond to the cross-sectional profile and critical dimensions of the features of the target periodic structure **53**. A similar optical metrology system **40** is described in co-pending U.S. patent application Ser. No. 09/727,530 entitled "System and Method for Real-Time Library Generation of Grating Profiles" by Jakatdar, et al., filed on November 28, 2000, <u>which issued as U.S. Patent No. 6,768,983 on January 27, 2004,</u> owned by the assignee of this application and incorporated herein by reference.

Please replace paragraph [0033] with the following amended paragraph:

[0033] FIG. 5A is an architectural diagram illustrating the creation of a simulation data store using a device simulator in one embodiment of the present invention. The profile-based creation of a simulation data store **100** includes a fabrication process designer **101** where the series of IC fabrication steps are laid out. A set of test grating masks is designed in the test grating mask designer **103** to capture key features or characteristics of the area of interest. For example, if the area of interest is capacitance of interconnects, then the set of test grating masks designed captures the various interconnect geometric information. Interconnect geometric information include profiles of structures in the wafer. The IC fabricator **105** uses the set of test grating masks to make test structures that are measured by a metrology device **107**. The metrology device **107**, which may be an optical metrology device or a non-optical metrology device, measures the signals off the test gratings and transmits the measured signals to the profiler application server **109**. The profiler application server **109** compares the measured signals off the test structures to the calculated signals in a profile library **110** covering a range of expected structures profile critical dimensions and resolutions. The profiler application server **109** selects the best matching profile library instance from the calculated signals of the profile library **110**. In one embodiment, the best matching measured diffracted metrology signal is one with the least error compared to the diffracted metrology signal. Several optimization procedures are available to minimize the error, such as simulated annealing, described in "Numerical Recipes," section 10.9, Press, Flannery, Teulkolsky & Vetterling, Cambridge University Press, 1986; which is incorporated by reference. One error metric that produces appropriate results is the sum-of-the-squared-difference error, where the optimization procedure minimizes the error metric between the measured diffracted metrology signal and the calculated diffracted metrology signal. The detailed procedure for creating calculated signals for a profile library for a range of structure profile critical dimensions and resolutions and selecting the best matching library instance from the calculated signals library is contained in co-pending U.S. patent application Ser. No. 09/727,530 entitled "System and Method for Real-Time Library Generation of Grating Profiles" by Jakatdar, et al., filed on November 28, 2000, <u>which issued as U.S. Patent No. 6,768,983 on January 27, 2004,</u> and is incorporated herein in its entirety by reference.

Please replace paragraph [0035] with the following amended paragraph:

[0035] FIG. 5B is an architectural diagram illustrating the creation of an interconnect simulation data store in one embodiment of the present invention. The profile-based creation of a simulation data store **120** includes a fabrication process designer **121** where the series of IC interconnects are laid out. A set of test grating masks is designed in the test grating mask designer **123** that captures the various interconnect geometric information. Interconnect geometric information include profiles of structures in the wafer. The IC fabricator **125** uses the set of test grating masks to make test structures that are measured by a metrology device **127**. The metrology device **127**, which may be a reflectometer, an ellipsometer or other non-optical metrology device, measures the diffracted signals off the test structures and transmits the measured signals to the profiler application server **129**. The profiler application server **129** compares the measured signals off the test structures to the calculated signals in a library **130** covering a range of expected structures profile critical dimensions and resolutions. The profiler application server **129** selects the best matching library instance from the library. The profile CD's of the best matching library instance is extracted by the profiler application server **129** and transmitted to the interconnect simulator **133**. The interconnect simulator **133** creates as output the set of process control parameters used in the simulation run and the device attributes. Examples of interconnect simulators include Raphael.TM, QuickCap.TM, and Atlas.TM. The output of the interconnect simulator **133** includes device attributes such as resistance in ohms, capacitance in farads, and inductance in henrys. The simulation data store generator **131** creates a data store instance in the simulation data store **135** for each test grating comprising signals, profile data, simulation type, and device attributes. Simulation type ~~is~~ <u>in</u> this case is interconnect device simulation and the device attributes are those associated with the interconnect device simulation. An illustrative layout of simulation data store is depicted in FIG. 10.

Please replace paragraph [0037] with the following amended paragraph:

[0037] Still referring to FIG. 6A, from the fabrication attributes **134**, the metrology simulator **137** extracts the profile data and calculates signals corresponding to the signals off a grating with

the transmitted profile shape and CD's. In a case where the metrology simulator **137** is an optical metrology simulator, the signals are simulated diffraction signals. For a description of the calculation of simulated diffraction signals, refer to co-pending U.S. patent application Ser. No. 09/764,780 entitled "Caching of Intra-Layer Calculations for Rapid Rigorous Coupled-Wave Analyses" by Jakatdar, et al., filed on January 26, 2000, <u>which has been expressly abandoned,</u> which is incorporated in its entirety herein by reference. The simulation data store generator **139** processes the process control parameters **132** and input data from the fabrication process simulator **133** and the metrology simulator **137** to create the simulation data store **149** instances. The simulation data store instance comprises signals, profile data, simulation type, process control parameters, and fabrication attributes associated with the process simulation. Simulation type is the characterization of the simulation being performed, for this example, fabrication process simulation. A partial list of simulation types is included in FIG.10.

Please replace paragraph [0043] with the following amended paragraph:

[0043] FIG. 7A is an architectural diagram illustrating inquiry and in-line use of a simulation data store in one embodiment of the present invention. An inquiry **203** from an inquiry device **201** is transmitted to a simulation data store server **207** that analyzes the inquiry and accesses the instance(s) of the simulation data store **215** and formulates the response **205**. The simulation data store server **207** may also be invoked by an in-line query **209** generating a response ~~**209**~~ <u>**213**</u>. In one application, the inquiry **209** is from an in-line query device **211** generating a response **213**. The inquiry **209** comprises the type of inquiry and query given data. Depending on the type of inquiry and query given data, the simulation data store server **207** retrieves the appropriate instance(s) of the simulation data store **215** and formats and transmits the response **213**. The in-line query device **211** may be part of a computer system or part of an IC fabrication system. The inquiry device **201** may be a stand-alone device or part of a system. Furthermore, the inquiry device **201** may be local or accessible through a network.

Please replace paragraph [0045] with the following amended paragraph:

[0045] FIG. 8A is a flow chart of the operational steps for creation of a profile-based simulation data store using profile library data in one embodiment of the present invention. The expected profile data ranges and resolutions of profile shapes of patterned structures for the profile library are determined **300**. For example, a trapezoidal profile shape may be characterized by the top CD, bottom CD, grating thickness, height and width at the inflection point, and underlying thickness in nanometers. The profile data ranges would include a minimum, maximum, and resolution for the top CD, bottom CD, grating thickness, height and so on. The profile data ranges at various resolutions of profile shapes are used to calculate the simulated diffracted signals and to create the profile library **320**. The detailed procedure for creating a profile library for a range of structure profile critical dimensions and resolutions is contained in co-pending U.S. patent application Ser. No. 09/727,530 entitled "System and Method for Real-Time Library Generation of Grating Profiles" by Jakatdar, et al., filed on November 28, 2000, which issued as U.S. Patent No. 6,768,983 on January 27, 2004, which is incorporated herein in its entirety by reference.

Please replace the Abstract with the following amended Abstract:

~~The invention includes a method and a system~~ An exemplary method and system for generating integrated circuit (IC) simulation information regarding the effect of design and fabrication process decisions~~. One embodiment~~ includes creating and using a data store of profile-based information comprising metrology signal, structure profile data, process control parameters, and IC simulation attributes.

~~Another embodiment is a~~ An exemplary method and system for generating a simulation data store using signals off test gratings that model the effect of an IC design and/or fabrication process~~. One application includes creation and use of~~ includes creating and using a simulation data store generated using test gratings that model the geometries of the IC interconnects. The interconnect simulation data store may be used in-line for monitoring electrical and thermal properties of an IC device during fabrication. Other embodiments include ~~methods and systems for generating and using simulation data stores~~ utilizing a metrology simulator and various combinations of a fabrication process simulator, a device simulator, and/or circuit simulator. ~~Information from the simulation data store may be used in-line in-situ during the design or fabrication process steps.~~